

Amendment Under 37 C.F.R. § 1.121(c)
U.S. Appln. No.: 10/606,965

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

Claim 1: (currently amended): An organically-functionalized carbon nanocapsule, comprising:

a hollow carbon nanocapsule having a purity of at least more than 50%; and

at least one kind of organic functional groups bonded thereon,

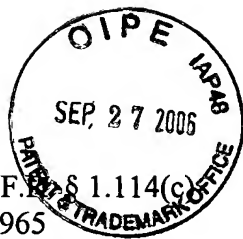
wherein the organically-functionalized carbon nanocapsule is of the following formula:

$F(-E)_n$, in which F is the carbon nanocapsule, E is the organic functional group, and n is the number of the organic functional group.

Claim 2: (original): The organically-functionalized carbon nanocapsule as claimed in claim 1, wherein the carbon nanocapsule is a polyhedral carbon cluster constituting multiple graphite layers having a balls-within-a ball structure, and the diameter of a carbon nanocapsule is 3-100 nm.

Claim 3-4: (canceled).

Claim 5: (original): The organically-functionalized carbon nanocapsule as claimed in claim 1, wherein n is 1-100,000.



Claim 6: (previously presented): The organically-functionalized carbon nanocapsule as claimed in claim 1, wherein each E is independently E₁, E₂, E₃, E₄ or E₅, in which each E₁, independently, is Y₁, Y₂-amino, (Y₁, Y₂-alkyl)amino, Y₁, Y₂-ethylenediamino, (dihydroxymethyl)alkylamino, (X₁, X₃-aryl)amino, or X₁, X₃-aryloxy; each E₂, independently, is Y₁, Y₂-alkoxy, (Y₁, Y₂-amino)alkoxy, (Y₁, Y₂, Y₃-aryl)oxy, (dihydroxyalkyl)aryloxy, (Y₁, Y₂, Y₃-alkyl)amino, (Y₁, Y₂, Y₃-aryl)amino, or dihydroxyalkylamino; each E₃, independently, is Y₁, Y₂, Y₃-alkoxy, (trihydroxyalkyl)alkoxy, (trihydroxyalkyl)alkylamino, (dicarboxyalkyl)amino, (Y₁, Y₂, Y₃-alkyl)thio, (X₁, X₂-aryl)thio, (Y₁, Y₂-alkyl)thio, (dihydroxyalkyl)thio, Y₁, Y₂-dioxoalkyl; each E₄, independently, is ((glycosidyl)oxoheteroaryl)amino, ((glycosidyl)oxoaryl)amino, (X₁, X₂, X₃-heteroaryl)amino, (X₁-diarylketone)amino, (X, X₁-oxoaryl)amino, (X, X₁-dioxoaryl) amino, (Y₁-alkyl, Y₂-alkyldioxoheteroaryl)amino, (Y₁-alkyl, Y₂-alkyldioxoaryl)amino, (di(Y₁, Y₂-methyl)dioxoheteroaryl)amino, (di(Y₁, Y₂-methyl)dioxoaryl)amino, ((glycosidyl)heteroaryl)amino, ((glycosidyl)aryl)amino, ((carboxylacetylalkyl)oxoheteroaryl)amino, ((carboxylacetylalkyl)oxoaryl)amino, ((isopropylaminohydroxyalkoxy)aryl)amino, or (X₁, X₂, X₃-alkylaryl)amino; each E₅, independently, is (X₁, X₂, X₃-heteroaryl)oxy, (isopropylaminohydroxyalkyl)aryloxy, (X₁, X₂, X₃-oxoheteroaryl)oxy, (X₁, X₂, X₃-oxoaryl)oxy, (X₁, Y₁-oxoheteroaryl)oxy, (X₁-diarylketone)oxy, (X, X₁-oxoaryl)oxy, (X₁, X₂-dioxoaryl)oxy, (Y₁, Y₂, di-aminodihydroxy)alkyl, (X₁, X₂-heteroaryl)thio, ((tricarboxylalkyl)ethylenediamino)alkoxy, (X₁, X₂-oxoaryl)thio, (X₁, X₂-dioxoaryl)thio, (glycosidylheteroaryl)thio, (glycosidylaryl)thio, Y₁-alkyl(thiocarbonyl)thio, Y₁,

Y_2 -alkyl(thiocarbonyl)thio, Y_1 , Y_2 , Y_3 -alkyl(thiocarbonyl)thio, (Y_1 , Y_2 -aminothiocarbonyl)thio, (pyranosyl)thio, cysteinyl, tyrosinyl, (phenylalanyl)amino, (dicarboxyalkyl)thio, (aminoaryl)₁₋₂₀ amino, or (pyranosyl)amino;

each X, independently, is halide; each of X_1 and X_2 , independently, is --H, -- Y_1 , --O-- Y_1 , --S-- Y_1 , --NH-- Y_1 , --CO--O-- Y_1 , --O--CO-- Y_1 , --CO--NH-- Y_1 , --CO-- NY_1Y_2 , --NH--CO-- Y_1 , --SO₂-- Y_1 , --CH Y_1Y_2 , or -- NY_1Y_2 ; each X_3 , independently, is -- Y_1 , --O-- Y_1 , --S-- Y_1 , --NH-- Y_1 , --CO--O-- Y_1 , --O--CO-- Y_1 , --CO--NH-- Y_1 , --CO-- NY_1Y_2 , --NH--CO-- Y_1 , --SO₂-- Y_1 , --CH Y_1Y_2 or -- NY_1Y_2 ;

each of Y_1 , Y_2 and Y_3 , independently, is --B--Z;

each B, independently, is --R_a--O--[Si(CH₃)₂--O--]₁₋₁₀₀, C₁₋₂₀₀₀ alkyl, C₆₋₄₀ aryl, C₇₋₆₀ alkylaryl, C₇₋₆₀ arylalkyl, (C₁₋₃₀ alkyl ether)₁₋₁₀₀, (C₆₋₄₀ aryl ether)₁₋₁₀₀, (C₇₋₆₀ alkylaryl ether)₁₋₁₀₀, (C₇₋₆₀ arylalkyl ether)₁₋₁₀₀, (C₁₋₃₀ alkyl thioether)₁₋₁₀₀, (C₆₋₄₀ aryl thioether)₁₋₁₀₀, (C₇₋₆₀ alkylaryl thioether)₁₋₁₀₀, (C₇₋₆₀ arylalkyl thioether)₁₋₁₀₀, (C₂₋₅₀ alkyl ester)₁₋₁₀₀, (C₇₋₆₀ aryl ester)₁₋₁₀₀, (C₈₋₇₀ alkylaryl ester)₁₋₁₀₀, (C₈₋₇₀ arylalkyl ester)₁₋₁₀₀, --R--CO--O--(C₁₋₃₀ alkyl ether)₁₋₁₀₀, --R--CO--O--(C₆₋₄₀ aryl ether)₁₋₁₀₀, --R--CO--O--(C₇₋₆₀ alkylaryl ether)₁₋₁₀₀, --R--CO--O--(C₇₋₆₀ arylalkyl ether)₁₋₁₀₀, (C₄₋₅₀ alkyl urethane)₁₋₁₀₀, (C₁₄₋₆₀ aryl urethane)₁₋₁₀₀, (C₁₀₋₈₀ alkylaryl urethane)₁₋₁₀₀, (C₁₀₋₈₀ arylalkyl urethane)₁₋₁₀₀, (C₅₋₅₀ alkyl urea)₁₋₁₀₀, (C₁₄₋₆₀ aryl urea)₁₋₁₀₀, (C₁₀₋₈₀ alkylaryl urea)₁₋₁₀₀, (C₁₀₋₈₀ arylalkyl urea)₁₋₁₀₀, (C₂₋₅₀ alkyl amide)₁₋₁₀₀, (C₇₋₆₀ aryl amide)₁₋₁₀₀, (C₈₋₇₀ alkylaryl amide)₁₋₁₀₀, (C₈₋₇₀ arylalkyl amide)₁₋₁₀₀, (C₃₋₃₀ alkyl anhydride)₁₋₁₀₀, (C₈₋₅₀ aryl anhydride)₁₋₁₀₀, (C₉₋₆₀ alkylaryl anhydride)₁₋₁₀₀, (C₉₋₆₀ arylalkyl anhydride)₁₋₁₀₀, (C₂₋₃₀ alkyl carbonate)₁₋₁₀₀, (C₇₋₅₀ aryl carbonate)₁₋₁₀₀, (C₈₋₆₀ alkylaryl carbonate)₁₋₁₀₀, (C₈₋₆₀ arylalkyl

carbonate)₁₋₁₀₀, --R₁--O--CO--NH--(R₂ or Ar--R₂--Ar)--NH--CO--O--(C₁₋₃₀ alkyl ether, C₆₋₄₀ aryl ether, C₇₋₆₀ alkylaryl ether, or C₇₋₆₀ arylalkyl ether)₁₋₁₀₀, --R₁--O--CO--NH--(R₂ or Ar--R₂--Ar)--NH--CO--O--(C₂₋₅₀ alkyl ester, C₇₋₆₀ aryl ester, C₈₋₇₀ alkylaryl ester, or C₈₋₇₀ arylalkyl ester)₁₋₁₀₀, --R₁--C--CO--NH--(R₂ or Ar--R₂--Ar)--NH--CO--O--(C₁₋₃₀ alkyl ether, C₆₋₄₀ aryl ether, C₇₋₆₀ alkylaryl ether, or C₇₋₆₀ arylalkyl ether)₁₋₁₀₀, --CO--NH--(R₂ or Ar--R₂--Ar)--NH--CO--O-- , --R₁ --O--CO--NH--(R₂ or Ar--R₂--Ar)--NH--CO--O--(C₂₋₅₀ alkyl ester, C₇₋₆₀ aryl ester, C₈₋₇₀ alkylaryl ester, or C₈₋₇₀ arylalkyl ester)₁₋₁₀₀, --R₃--O--CO--NH--(R₂ or Ar--R₂--Ar)--NH--CO--O-- , --R₁ --NH--CO--NH--(R₂ or Ar--R₂--Ar)--NH--CO--O--(C₁₋₃₀ alkyl ether, C₆₋₄₀ aryl ether, C₇₋₆₀ alkylaryl ether, or C₇₋₆₀ arylalkyl ether)₁₋₁₀₀, --R₁--NH--CO--NH--(R₂ or Ar--R₂--Ar)--NH--CO--O--(C₂₋₅₀ alkyl ester, C₇₋₆₀ aryl ester, C₈₋₇₀ alkylaryl ester, or C₈₋₇₀ arylalkyl ester)₁₋₁₀₀, --R₁--NH--CO--NH--(R₂ or Ar--R₂--Ar)--NH--CO--O--(C₁₋₃₀ alkyl ether, C₆₋₄₀ aryl ether, C₇₋₆₀ alkylaryl ether, or C₇₋₆₀ arylalkyl ether)₁₋₁₀₀, --CO--NH--(R₂ or Ar--R₂--Ar)--NH--CO--O-- , --R₁--NH--CO--NH--(R₂ or Ar--R₂--Ar)--NH--CO--O--(C₂₋₅₀ alkyl ester, C₇₋₆₀ aryl ester, C₈₋₇₀ alkylaryl ester, or C₈₋₇₀ arylalkyl ester)₁₋₁₀₀, --R₃--O--CO--NH--(R₂ or Ar--R₂--Ar)--NH--CO--O-- , --R₁--O--CO--NH--(R₂ or Ar--R₂--Ar)--NH--CO--NH--(C₂₋₅₀ alkyl amide, C₇₋₆₀ aryl amide, C₈₋₇₀ alkylaryl amide, or C₈₋₇₀ arylalkyl amide)₁₋₁₀₀, or --R₁--NH--CO--NH--(R₂ or Ar--R₂--Ar)NH--CO--NH--(C₂₋₅₀ alkyl amide, C₇₋₆₀ aryl amide, C₈₋₇₀ alkylaryl amide, or C₈₋₇₀ arylalkyl amide)₁₋₁₀₀;

each Z, independently, is--C--D, wherein each C, independently, is --R--, --R--Ar--, --Ar--R--, or --Ar--; and each D, independently, is --OH, --SH, --NH₂, --NHOH, --SO₃H, --OSO₃H, --COOH, --CONH₂, --CO--NH--NH₂, --CH(NH₂)--COOH, --P(OH)₃, --PO(OH)₂, --O--PO(OH)₂, -

-O--PO(OH)--O--PO(OH)₂, --O--PO(O⁻)--O--CH₂CH₂NH₃⁺, -glycoside, --OCH₃, --O--CH₂--(CHOH)₄--(CH₂)₄--CH, --O--CH₂--(CHOH)₂--CHOH, --C₆H₃(OH)₂, --NH₃⁺, --N⁺HR_bR_c, or N⁺HR_bR_cR_d; wherein each of R, R₁, R₂, R₃, R_a, R_b, R_c, and R_d independently, is C₁₋₃₀ alkyl, each Ar, independently, is aryl.

Claim 7: (original): The organically-functionalized carbon nanocapsule as claimed in claim 1, wherein the carbon nanocapsule is functionalized by a redox reaction.

Claim 8: (original) The organically-functionalized carbon nanocapsule as claimed in claim 1, wherein the carbon nanocapsule is functionalized by a cycloaddition reaction .

Claim 9: (original) The organically-functionalized carbon nanocapsule as claimed in claim 1, wherein the carbon nanocapsule is functionalized by a radical addition reaction.

Claim 10: (currently amended) An organically-functionalized carbon nanocapsule, comprising:

a hollow carbon nanocapsule having a purity of at least more than 50%; and

at least one kind of organic functional groups bonded thereon,

wherein the organically-functionalized carbon nanocapsule is of the following formula:

$F(-E)_n$, in which F is the carbon nanocapsule, E is the organic functional group selected from -OH, -C=O, -CHO or -COOH, n is the number of the organic functional group, and the carbon nanocapsule F is functionalized by a redox reaction.

Claim 11: (original) The organically-functionalized carbon nanocapsule as claimed in claim 10, wherein the carbon nanocapsule is a polyhedral carbon cluster constituting multiple graphite layers having a balls-within-a ball structure, and the diameter of a carbon nanocapsule is 3-100 nm.

Claims 12-13: (cancelled).

Claim 14: (original) The organically-functionalized carbon nanocapsule as claimed in claim 10, wherein n is 1-100,000.

Claim 15: (currently amended) An organically-functionalized carbon nanocapsule, comprising:

a hollow carbon nanocapsule having a purity of at least more than 50%; and

at least one kind of organic functional groups bonded thereon,

wherein the organically-functionalized carbon nanocapsule is of the following formula:

$F(-E)_n$, in which F is the carbon nanocapsule, E is the organic functional group selected from $-NHAr$, $-N^+(CH_3)_2Ar$, $=CCl_2$ or amino group, n is the number of the organic functional group, and the carbon nanocapsule F is functionalized by a cycloaddition reaction.

Claim 16: (original) The organically-functionalized carbon nanocapsule as claimed in claim 15, wherein the carbon nanocapsule is a polyhedral carbon cluster constituting multiple graphite layers having a balls-within-a ball structure, and the diameter of a carbon nanocapsule is 3-100 nm.

Claims 17-18: (cancelled).

Claim 19: (original) The organically-functionalized carbon nanocapsule as claimed in claim 15, wherein n is 1-100,000.

Claim 20: (currently amended) An organically-functionalized carbon nanocapsule, comprising:

a hollow carbon nanocapsule having a purity of at least more than 50%; and

at least one kind of organic functional groups bonded thereon,

wherein the organically-functionalized carbon nanocapsule is of the following formula:

$F(-E)_n$, in which F is the carbon nanocapsule, E is the organic functional group selected from -OH, $-\text{OSO}_3^-$, $-\text{C}(\text{CH}_3)_2\text{COOCH}_3$ or $-\text{C}(\text{CH}_3)_2\text{CN}$, n is the number of the organic functional group, and the carbon nanocapsule F is functionalized by a radical addition reaction.

Claim 21: (original) The organically-functionalized carbon nanocapsule as claimed in claim 20, wherein the carbon nanocapsule is a polyhedral carbon cluster constituting multiple graphite layers having a balls-within-a ball structure, and the diameter of a carbon nanocapsule is 3-100 nm.

Claims 22-23: (cancelled).

Claim 24: (original) The organically-functionalized carbon nanocapsule as claimed in claim 20, wherein n is 1-100,000.